U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Synthliboramphus hypoleucus*

COMMON NAME: Xantus's murrelets

LEAD REGION: Region 8

INFORMATION CURRENT AS OF: November 2005

STATUS/ACTION

___ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

___ New candidate

_X_ Continuing candidate

___ Non-petitioned

_X_ Petitioned - Date petition received: 8 April 2002

_ 90-day positive - FR date:

_ 12-month warranted but precluded - FR date:

_ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions. During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov).

___ Listing priority change

Former LP: ___

New LP: ___

Date when the species first became a Candidate (as currently defined): 5/4/2004

___ Candidate removal: Former LPN: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Birds, Alcidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: California, Mexico

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: California, Mexico

LAND OWNERSHIP:
Table 1: Land ownership of islands with known or historical Xantus's murrelet nesting colonies

Island	**Ownership**
Santa Barbara	National Park Service
Anacapa	National Park Service
Santa Cruz	National Park Service, Nature Conservancy
Santa Rosa	National Park Service
San Miguel	Department of the Navy, but managed by National Park Service
San Nicolas	Department of the Navy
San Clemente	Department of the Navy
Santa Catalina	Privately owned
Guadalupe	Mexican Government (Vizcaino Biosphere Reserve)
Los Coronados	Mexican Government (National Protected Areas Office)
Todos Santos	Mexican Government (National Protected Areas Office)
Natividad	Mexican Government (Vizcaino Biosphere Reserve)
San Roque	Mexican Government (Vizcaino Biosphere Reserve) Vizcaino Biosphere Reserve

Asunción	Mexican Government (Vizcaino Biosphere Reserve)
San Benito	Mexican Government

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BIOLOGICAL INFORMATION

Species Description

Xantus's murrelet (*Sythliboramphus hypoleucus*) is a small seabird, 23-25 centimeters (9-10 inches) in length and weighs approximately 148-167 grams (5-6 ounces) (Jehl and Bond 1975, Murray et al. 1983). Plumage is black above and white below, and except upon careful inspection, winter plumage is not different from breeding plumage (Drost and Lewis 1995). They fly close to the water with their heads held straight (Griggs 1997). They are known to live up to 15 years of age in the wild (Carter et al. 1992).

Taxonomy

We have reviewed the available scientific literature regarding the taxonomic status of *Synthliboramphus hypoleucus* and conclude that it is still considered a distinct species. Although *S. hypoleucus* is similar in appearance to the closely-related *Synthliboramphus craveri* (Craveri's murrelet), they apparently do not interbreed where their breeding ranges overlap in Mexico, as *S. craveri* nests much earlier in the season (December through March) (Jehl and Bond 1975). This taxonomic status appears to be widely accepted (e.g., Jehl and Bond 1975, DeWeese and Anderson 1976, Drost and Lewis 1995, Gaston and Jones 1998).

Synthliboramphus hypoleucus is divided into two subspecies: *Synthliboramphus hypoleucus scrippsi* and *S. h. hypoleucus* (Jehl and Bond 1975, Drost and Lewis 1995). Substantial declines have been documented in both subspecies, and the species as a whole has been assigned candidate status. The subspecies differ in breeding range, facial plumage, bill size, and vocalizations (Drost and Lewis 1995; Jehl and Bond 1975). *S. h. scrippsi* nests from the Channel Islands off the southern California coast south to San Benito Islands in Mexico; *S. h. hypoleucus* nests farther south, primarily on Guadalupe and San Benito Islands off Baja California, Mexico (Jehl and Bond 1975, Drost and Lewis 1995, Keitt 2000). Both subspecies occur, as well very small numbers of an intermediate form (indicative of limited interbreeding), on San Benito Island (Jehl and Bond 1975, Winnett et al. 1979, Keitt 2000, Whitworth et al. 2003).

S. h. scrippsi has a bill that is slightly shorter and thicker than *S. h. hypoleucus* (Jehl and Bond 1975). In *S. h. scrippsi*, the area in front of and behind the eye is black with a dividing line

between the black crown and face and white throat extending straight back from the bill; *S. h. hypoleucus* has white extending up in front of the eye, white above the gape, broader white below the eye, and paler grayish feathers that cover the ear openings (Jehl and Bond 1975). *S. h. scrippsi* has a series of three to eight high-pitched peeping notes whereas *S. h. hypoleucus* has a rattle similar to the Craveri's murrelet (Jehl and Bond 1975).

Habitat/Life History

Xantus's murrelets spend the majority of their lives at sea, only coming to land to nest. They begin arriving within the vicinity of nesting colonies in December and January (Murray et al. 1983; Gaston and Jones 1998). They likely begin breeding at two to four years of age, and usually nest at the same site each year with the same mate (Murray et al. 1983, Drost and Lewis 1995, Sydeman et al. 1998). They begin visiting nest sites up to two months before egg-laying, but typically two to three weeks prior (Murray et al. 1983). Nesting within the population is asynchronous, spanning a period of up to four months (March-June), and peak time of egg-laying varies from year to year (Hunt et al. 1979, Murray et al. 1983).

At night throughout the breeding season, Xantus's murrelets congregate on the water adjacent to nesting colonies (Hunt et al. 1979, Murray et al. 1983, Whitworth et al. 2000). The purpose of these nocturnal at-sea congregations may be for socialization, courtship, pairing, and pair-bond maintenance and the birds engage in vocal activities (Gaston 1992). The majority of murrelets attending congregations are likely non-incubating, because incubating murrelets may only briefly attend congregations before flying to nests after return from foraging trips, or during chick departures from the nest (Hunt et al. 1979, Gaston 1992, Whitworth et al. 1997).

Xantus's murrelets nest in small caves, rock crevices, cavities under boulders or roots, and under dense vegetation on offshore islands or associated rocks, often along steep slopes or cliffs (Hunt et al. 1979, Murray et al. 1983, Drost and Lewis 1995). No additional material is added to the nest, and the site may either be a shallow scrape if the ground is soft, or remain unmodified (Murray et al. 1983, Drost and Lewis 1995). They are nocturnal in their arrival to or departure from nests, presumably to avoid detection by avian predators such as gulls, owls, and falcons (Murray et al. 1983, Gaston and Jones 1998, Whitworth and Carter 2002).

Xantus's murrelets typically lay two eggs, and both parents share incubation duties (Murray et al. 1983). The first egg is left unattended until after the second egg is laid, for an average of eight days (range: five to 12 days), and incubation lasts about 34 days after clutch completion (range: 27-44 days) (Murray et al. 1983). Eggs are periodically left unattended during incubation, presumably because one member of the pair will depart to feed before the other returns, and egg neglect increases the total length of incubation (Murray et al. 1983). Unattended eggs are susceptible to predation by native deer mice or introduced rats (Murray et al. 1983). Each parent spends an average of three consecutive days incubating eggs before being relieved by the mate (range: one to six days) (Murray et al. 1983). These incubation shifts are among the longest recorded for alcids (Drost and Lewis 1995).

Chicks hatch between early April and early July, and are born precocial (covered with down and fully active) (Murray et al. 1983). The chicks are not fed in the nest after hatching, but go to sea with their parents at about two days of age (range: one to five days) (Murray et al. 1983). The chicks are escorted out of the nest by their parents, and then they either jump from the cliff edge or are blown into the surf below, while the parents vocalize from the sea below (Murray et al. 1983). Family groups swim rapidly offshore and away from nesting colonies, presumably to avoid predators (Murray et al. 1983). The chicks are reared at sea by their parents, and they remain with their parents at sea for an unknown amount of time (Murray et al. 1983).

Xantus's murrelets swim underwater to capture prey, using their wings as flippers to propel themselves forward in a technique known as pursuit-diving (Gaston and Jones 1998). They feed offshore in small, dispersed groups, usually in singles and pairs, but occasionally in groups of up to eight (Howell 1910, Hunt et al. 1979, Drost and Lewis 1995). They feed on small fish and zooplankton, and are known to forage at ocean fronts where prey is likely concentrated near the surface of the water (Hunt et al. 1975, Hamilton et al. 2004, Hamilton 2005). During the breeding season, the distance that Xantus's murrelets travel from the nesting colony to obtain prey is highly variable and probably dependent upon the availability and location of prey patches (Whitworth et al. 2000, Hamilton 2005). For example, Xantus's murrelets from Santa Barbara Island foraged far from the island in 1996 (mean = 62 km) and 1997 (mean = 111 km) (Whitworth et al. 2000), whereas most foraging locations of murrelets from Anacapa Island in 2002 and 2003 were within 20 km of the island (Hamilton 2005). Long incubation shifts, the ability to leave eggs unattended, and the fact that chicks go to sea at two days of age may allow for long-distance foraging away from nesting colonies to obtain prey (Carter et al. 1992). After the breeding season, Xantus's murrelets generally move northward and offshore (Drost and Lewis 1995).

Historical Range/Distribution

The historical breeding range of Xantus's murrelets was from the Channel Islands in southern California to islands off the west coast of Baja California, Mexico (Jehl and Bond 1975; Hunt et al. 1979, 1980; Drost and Lewis 1995; Carter et al. 2000). Known nesting islands included San Miguel, Santa Cruz, Anacapa, Santa Barbara, San Clemente, and Santa Catalina Islands in southern California (collectively known as the Channel Islands), and Coronados, Todos Santos, San Geronimo, San Martin, San Benito, Guadalupe, Natividad, San Roque, and Asuncion Islands off the coast of Baja California, Mexico (Drost and Lewis 1995).

Current Range/Distribution

The current breeding range of Xantus's murrelets is from the Channel Islands in southern California to islands off the west coast of Baja California, Mexico (Jehl and Bond 1975; Hunt et al. 1979, 1980; Drost and Lewis 1995; Carter et al. 2000). *S. h. scrippsi* nests on San Miguel Island, Santa Cruz Island, Anacapa Island, Santa Barbara Island, San Clemente Island, and Santa Catalina Island in southern California, and on Coronados, Todos Santos, San Geronimo, San Martin, and San Benito Islands in Baja California, Mexico (Carter et al. 1992; Drost and Lewis

1995; Keitt 2000). The current breeding range of *S. h. hypoleucus* is smaller than the historical range, this subspecies currently nests only on San Benito and Guadalupe Islands off the coast of Baja California, Mexico (Drost and Lewis 1995; Carter et al. 1996; Keitt 2000). Three of the historical nesting colonies for *S. h. hypoleucus*, Natividad, San Roque, and Asuncion Islands, have been extirpated since at least 1975 (Jehl and Bond 1975; Keitt 2000)

Post-breeding and winter distribution of Xantus's murrelets has been recorded from Baja California, Mexico, north to southern British Columbia (Drost and Lewis 1995; Howell and Webb 1995; Whitworth et al. 2000). They have been observed and are thought to winter in the Southern California Bight as well as the warmer offshore waters of Baja California, California, Oregon, and Washington (Briggs et al. 1987; Drost and Lewis 1995). The largest numbers documented during the winter have been from Point Conception to Monterey Bay and Point Año Nuevo (Briggs et al. 1987).

Population Estimates/Status

Xantus's murrelets appeared to be fairly abundant and were referred to as "common" in early accounts (Grinnell and Miller 1944; Howell 1917), although there are no reliable estimates of the historical population. Since the late 19th century, however, population estimates have indicated that they have declined considerably (Drost and Lewis 1995; McChesney and Tershy 1998; PSG 2002). Estimates of the breeding and total population size are difficult to determine because of the species' secretive nature at nesting colonies, nesting habitats that are difficult or impossible to access, and their scattered and pelagic distribution at sea. However, the most recent estimate of the population is <10,000–20,000 breeding pairs (Drost and Lewis 1995, Gaston 1998, McChesney and Tershy 1998, Carter et al. 2000, Wolf 2002). Approximately eighty percent of the world population breeds at four locations: Santa Barbara Island, Coronados Islands, San Benito Island, and Guadalupe Island (CDFG 2002).

Santa Barbara Island is probably the largest breeding colony in California, with approximately 500-1250 breeding pairs (H. R. Carter, unpubl. data). There was evidence of a substantial population decline of 30 to 72 percent from 1977 to 1991; the degree of decline is uncertain due to differences in survey techniques (Hunt et al. 1979, Carter et al. 1992, Sydeman et al. 1998). Nest site occupancy also decreased during the 1990's (Wolf et al. 2000). Average productivity from 1983 to 1995 was low, at 0.81 chicks per pair (Sydeman et al. 1998). In contrast, Craveri's murrelets average 1 to 1.5 chicks per pair and Ancient murrelets (*Synthliborampus antiquus*) average 1.44 to 1.69 chicks per pair (Gaston and Jones 1998), and this lower productivity may be a result of high levels of predation rather than a natural life history trait (PSG 2002). If the trend of an annual 2.5-5.3 percent decline continues, numbers at this colony may reach a level at which the likelihood of survival is decreased and would eventually lead to the colony's extirpation (Sydeman et al. 1998). The extirpation of such a large breeding colony would increase the probability of extinction.

Anacapa Island, probably the second-largest breeding colony of Xantus's murrelets in southern California (200-600 pairs) (H.R. Carter, unpubl. data), has also likely suffered population declines in the last century due the presence of non-native predators (e.g., rats and cats, see

predation section below) (McChesney et al. 2000).

Table 1: Recent population estimates of Xantus's murrelet nesting colonies in southern California and Baja California, Mexico.

Island	Breeding pairs	Year
Santa Barbara[1]	500-1,250	2002
Anacapa[1]	200-600	2002
Santa Cruz[1]	100-300	1996
San Miguel[1]	50-300	1996
Santa Catalina[1]	25-75	2000
San Clemente[1]	10-50	1996
Coronados[2]	1,500-3,500	1999
Todos Santos[2]	50-250	1999
San Martín[2]	50-250	1999
San Gerónimo[2]	100-500	1999
San Benito[3]	500-1,000	2002
Guadalupe[4]	2,400-3,500	1968

[1] H. R. Carter, unpubl. data, May 2002, in CDFG 2002
[2] Keitt 2000; Population estimates thought to be high (B. Keitt, Island Conservation and Ecology Group, pers. comm. 2003)
[3] Whitworth et al. 2003
[4] Delong and Crossin 1968

THREATS

A. <u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>.

<u>Introduced Species</u>

The introduction of non-native mammals has caused habitat modification and degradation of Xantus's murrelets nesting colonies at Anacapa Island, Santa Barbara Island, and nearly all of the Mexican islands in the last century (Everett and Anderson 1991; Drost and Lewis 1995; McChesney and Tershy 1998; McChesney et al. 2000; Keitt 2000). Habitat modification as a result of livestock grazing, farming, and burning has resulted in decreases in suitable nest sites and increased competition for remaining sites. Sheep (*Ovis aries*), European rabbits (Leporidae), pigs (*Sus scrofa*), cattle (*Bos* sp.), and goats (*Capra hirca*) have heavily grazed native vegetation, which resulted in a loss of vegetative diversity (McChesney and Tershy 1998). Loss of shrub cover resulted in the loss of suitable nest sites (Ingram and Jory Carter 1997) because vegetated nest sites offer protection from heat and predators (Carter et al. 1992). In

addition to grazing on native vegetation, rabbits also competed for burrows and nest site crevices (Moors and Atkinson 1984; McChesney and Tershy 1998). Displaced birds may not breed at all (Carter et al. 1992). In addition to the indirect effects caused by non-native species, large grazing animals may have crushed burrows and young (McChesney and Tershy 1998).

Non-native species have been eradicated from several nesting colonies. Rabbits were eradicated from East Anacapa Island sometime after 1965 (McChesney and Tershy 1998). The National Park Service and U.S. Fish and Wildlife Service began removing rabbits from Santa Barbara Island in 1954, and they were fully eradicated in 1959 as a result of an accidental fire (McChesney and Tershy 1998). Rabbits were eradicated from Todos Santos Islands in 1998 (McChesney and Tershy 1998). Sheep and goats were eradicated from Natividad Island in 1997 (Keitt 2000). In 1998-2001, rabbits were eradicated from the San Benito Islands (Keitt 2000). However, goats remain in large numbers on Guadalupe Island (McChesney and Tershy 1998), and a few burros remain on the Coronados Islands, San Benito Islands, and Todos Santos Islands (Keitt 2000).

Although non-native herbivores have been absent from Santa Barbara Island since the late 1950s (Sumner 1958), their presence as well as the presence of farming may have facilitated the introduction and spread of non-native grasses (Murray et al. 1983). This conversion of native habitat to non-native grassland is thought to have increased the endemic deer mouse (*Peromyscus maniculatus elusus*) population, a predator of Xantus's murrelet eggs (Murray et al. 1983) (see predation section below).

Human Disturbance

ChevronTexaco Corporation recently proposed to build a liquefied natural gas (LNG) receiving and regasification terminal approximately 600 meters from shore off the northeast side of South Coronado at the Coronados Islands in Mexico (Lindquist 2004). The terminal would be a fixed 980-foot-long concrete island with two regasification plants, storage tanks, a heliport, and a dock that would receive LNG tankers every four days. Approximately 40-50 employees would live and work aboard the structure. The construction and operation of this facility may impact the Xantus's murrelet nesting colony at the Coronados Islands. Potential sources of disturbance include: (1) bright lights at night from the facility and visiting tanker vessels; (2) noise from the facility; (3) noise from helicopters visiting the facility; (4) ingress and egress of tanker vessels or other vessels transporting personnel and supplies. Additionally, spills associated with liquefied natural gas receiving activities could contaminate the nearshore waters.

Each year, approximately 30,000 people visit the Channel Islands National Park and waters, and an additional 60,000 people enter park waters without accessing land (CINP home page 2002). Visitors increase the risk of accidental introduction of non-native species to the islands. Kayaking in sea caves may disturb nesting Xantus's murrelets, although it is unknown how much disturbance occurs. The National Park Service has been working to reduce this threat by educating kayak guides on caves to avoid due to the presence of nesting Xantus's murrelets and distances from cliff walls that should be maintained (Kate Faulkner, National Park Service, pers. comm. 2003). Some guides have been instructed by biologists and park rangers to avoid caves where seabirds are seen flying in with fish, which indicates the presence of a nest (Weiss 2002).

Fishing villages

Fishing villages on nesting islands in Mexico are another source of human disturbance, although effects on the Xantus's murrelet are not known (PSG 2002). Visitors and the presence of fishing villages at nesting colonies increases the risk of introducing predators such as rats and cats. San Benitos Islands, Todos Santos Islands, San Martin Island, San Gerònimo Island, and Natividad Island all have fishing villages or camps (Keitt 2000).

Chronic oil pollution

Oil spills are another potential threat to the survival of Xantus's murrelets. Two of three major marine shipping traffic lanes in southern California pass within 25 kilometers of most of the nesting islands in the U.S., including Santa Barbara Island. The third marine shipping traffic lane occurs within 25 kilometers of the Coronados Islands (Carter et al. 2000). Several of the 35 offshore oil platforms in southern California are 12 to 30 kilometers from most of the nesting islands in the U.S, and since at-sea distribution of Xantus's murrelets is highly variable from year to year, all of them are located within potential foraging habitat (PSG 2002). Oil spills have been documented from offshore platforms, pipelines, tankers, and other military and commercial shipping (Anderson et al. 1993; Carter and Kuletz 1995; Carter et al. 2000). Oil spills also result from unloading and loading cargo from onshore and offshore facilities, cleaning of tanks at sea, and bilge pumping (Carter and Kuletz 1995).

There were at least 347 oil spills in excess of 10,000 gallons between 1960 and 1997 in California (Oil Spill Intelligence Report 1997). A large oil spill has the potential to lead to the extirpation of the U.S. breeding population or even extinction of the Xantus's murrelet, due to the species' extremely limited distribution and tendency to aggregate at nocturnal congregations adjacent to nesting colonies and offshore at foraging areas during the breeding season (Carter et al. 2000; Drost and Lewis 1995). Oil spills also adversely affect fish populations (Carter and Kuletz 1995), which could limit prey resources for Xantus's murrelets and other seabirds.

Since 1977, offshore oil and gas activities have increased. Currently, there are 23 producing oil and gas platforms from 43 Federal leases in outer continental shelf waters of California (Mark Pierson, Mineral Management Service, pers. comm. 2003). Companies have submitted requests for suspensions and schedules of activities for exploration and development of the remaining 36 undeveloped leases. Offshore oil drilling along the California coast is expected to decline because of a moratorium on new leases of drilling sites for at least ten years (Mark Pierson, Mineral Management Service, pers. comm. 2003).

Effects of oil spills on small seabirds include death, reduction in numbers of breeding birds, reductions in breeding range, and reduced breeding success (Carter and Kuletz 1995). Mortalities occur as a result of ingestion when they try to preen oil off their feathers, and hypothermia, as oil destroys the waterproofing capabilities of feathers (American Trader Trustee Council 2001). There are also several sublethal and lasting health impacts on oiled birds, such as decreased reproductive output, whether or not they receive rehabilitation (Carter and Kuletz 1995). Dead or dying Xantus's murrelets are difficult to recover because they rarely wash ashore due to prevailing winds and currents, and because oiled carcasses often sink or are scavenged (American Trader Trustee Council 2001; PSG 2002). However, small numbers of

dead oiled Xantus's murrelets have been reported on beaches in central California (Carter et al. 2000).

B. Overutilization for commercial, recreational, scientific, or educational purposes. Overutilization for commercial, recreational, scientific, or educational purposes is not a known threat to this species.

C. Disease or predation.

Disease
Disease is not a known threat to this species. Parasites have been recovered from the digestive tract of adults including a cestode *Tetrabothrius* sp. and two nematodes, *Contracaecum* sp. and *Seuratia* sp. (Drost and Lewis 1995). However, nothing is known regarding the effects of these parasites. No ectoparasites, nest parasites, or commensals have been reported for the species (Drost and Lewis 1995).

Predation
Small seabirds such as Xantus's murrelets are especially susceptible to depredation due to their low annual reproductive output, small size, and lack of effective anti-predator behavior (Moors and Atkinson 1984). Seabird declines and extirpations at nesting colonies have been caused by non-native predators such as non-native rats (*Rattus* sp.) and feral cats (*Felis catus*) (Moors and Atkinson 1984; Everett and Anderson 1991; Bertram 1995; Seto and Conant 1996; McChesney and Tershy 1998; Gaston and Jones 1998; Keitt 2000). Dogs (*Canis familiarus*) may also prey on seabirds and destroy burrows and nest sites.

Rats prey primarily on Xantus's murrelet eggs and chicks, but are also capable of killing adults (Moors and Atkinson 1984; McChesney and Tershy 1998). Rats have been reported to depredate unattended as well as incubated eggs (Seto and Conant 1996). One report documented how rats efficiently killed Ancient murrelets by attacking and wounding the nape region (Betram 1995). Rat predation on seabird eggs is inferred by inspecting egg fragments and the nesting site; large bite marks (as opposed to small bite marks, indicative of mice), and the presence of rat feces are typical signs of rat predation (H. Carter, pers. comm 2003).

Rats, cats, and dogs are present on several Xantus's murrelets nesting islands. Rats and cats were introduced at several nesting islands in Baja California by fishermen, and it is believed that cats were left on the islands and became feral (McChesney and Tershy 1998). Dogs occur on nine of the northwestern Baja California Islands and have become feral on Guadalupe and Cedros Islands (McChesney and Tershy 1998). Dogs were also reported on San Benito Islands, Natividad Island, San Gerònimo Island, and Guadalupe Island in 1999 (Keitt 2000). As of 2001, rats were reported on all of the Channel Islands except Santa Barbara Island (Whitworth and Carter 2002). Rats were found on San Miguel Island in the 1980s (McChesney and Tershy 1998) and were introduced to Anacapa Island in the mid-1800s or early 1900s (McChesney and Tershy 1998).

Rats were eradicated from Anacapa Island in 2002 (American Trader Trustee Council 2001).

Prior to the removal of rats on Anacapa Island, in 1997, of a small sample of nests, only 9 percent of eggs hatched while 56 percent were rodent-depredated (McChesney et al. 2000). In 2003 and 2004, after the removal of rats on Anacapa Island, 79 percent of nests hatched successfully (Whitworth et al. 2004). Thus, the population on Anacapa Island is likely to increase over time as a result of increased productivity (Whitworth et al. 2004). Biologists will continue to monitor the absence/presence of rats, as well as reproductive success of Xantus's murrelets at Anacapa Island, in order to determine the success of the eradication effort. Even if successful, it may take at least ten years to detect an increase in the population size, given their low reproductive rates and nest site fidelity which may prevent emigration from other colonies (CDFG 2002).

The use of rodenticides has resulted in the successful eradication of rats from over 30 islands worldwide ranging in size from 10 to 3,300 hectares (American Trader Trustee Council 2001). Rats were eradicated in 1994 from San Roque Island, Mexico, and reports of rats from other Mexican islands (such as Todos Santos and San Martín Islands) may have been the endemic woodrat (*Neotoma* sp.), which poses little threat to Xantus's murrelets because it is vegetarian (McChesney and Tershy 1998).

Cats were thought to be responsible for the low numbers and near extirpation of Xantus's murrelets on Santa Barbara Island in the late 1800s and early 1900s (Howell 1917). The National Park Service removed cats from Santa Barbara Island by 1978 (Murray et al. 1983). Cats were introduced on Anacapa Island in the 1930s, and the last cat died in 1975 or 1976 (Anderson et al. 1989 in McChesney and Tershy 1998). In southern California, cats are also reported to occur on San Nicholas Island, Santa Catalina Island, and San Clemente Island (McChesney and Tershy 1998).

In Mexico, most of the northwest Baja California islands have harbored populations of feral cats, usually introduced by fishermen or military personnel (McChesney and Tershy 1998). Currently, cats occur on Guadalupe Island, although they do not occur on any offshore islets where most seabird nesting occurs (McChesney and Tershy 1998). Cats also occur on North Todos Santos Island and possibly South Coronado Island (McChesney and Tershy 1998, Keitt 2000). Cats once occurred on San Benito Island, but have not been present since 1992 (McChesney and Tershy 1998). Cats have been removed from several nesting islands, including North Coronado Island, San Gerónimo, San Martin (McChesney and Tershy 1998; Keitt 2000).

Known native predators at nesting colonies include deer mice, barn owls (*Tyto alba*), western gulls (*Larus occidentalis*), island spotted skunks (*Spilogale gracilis amphiala*) and peregrine falcons (*Falco peregrinus*) (Murray et al. 1983; Drost and Lewis 1995; McChesney and Tershy 1998). The conversion of native habitat to non-native grassland on Santa Barbara Island is thought to have increased the endemic deer mouse population (Murray et al. 1983). In a study conducted from 1976 to 1978, deer mice consumed 44 percent of Xantus's murrelet eggs (Murray et al. 1983). Predation by barn owls on Santa Barbara Island has been found to depend on the availability of other prey such as deer mice; when mice are rare, the number of Xantus's murrelets killed increases (Drost and Lewis 1995). Western gulls occasionally take Xantus's murrelet chicks, usually during the time that the chicks leave the nest and join their families at

sea (Murray et al. 1983, Drost and Lewis 1995). Peregrine falcons are known to pursue and kill small adult seabirds, and may become an increasing threat due to their continued recolonization of the west coast (Drost and Lewis 1995). They previously experienced a severe decline in the 1960s due to effects from DDT (Musitelli 2000). Skunks are known to eat bird eggs and chicks. Island fox (*Urocyon littoralis*) are a potential native predator, as they are known to eat bird eggs. This predator is thought to limit Xantus's murrelets nesting colonies in the U.S., as Xantus's murrelets only nests in substantial numbers on islands without island fox (e.g., Anacapa and Santa Barbara Islands) (Sowls et al. 1980; Drost and Lewis 1995).

D. The inadequacy of existing regulatory mechanisms.
Xantus's murrelets are designated as threatened under the California Endangered Species Act (CESA) (California Regulatory Notice Register 2004). Section 2080 of the Fish and Game Code prohibits "take" of any species that the commission determines to be an endangered or threatened species. Take is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." However, unlike federally listed species, "harassment" is not included in the Fish and Game Code's definition of take, giving it fewer protections than if it were federally listed.

Xantus's murrelets are protected under the Migratory Bird Treaty Act of 1918 (MBTA). The MBTA protects migratory birds and their parts (including eggs, nests, and feathers). However, the MBTA provides no protection for the habitat of birds. Protections of Xantus's murrelets by the MBTA have not been sufficient to arrest or reverse the decline on the species.

Under the World Conservation Union (IUCN), the Xantus's murrelet is listed as "near threatened" and is considering to uplist it as "vulnerable" (Sydeman and Nur 2000). The Xantus's murrelet is listed as threatened in Mexico under *Norma Oficial Mexcana* NOM-Ecol-059 (Keitt 2000).

The U.S. Fish and Wildlife Service designated the Xantus's murrelet as a Category 2 in November 1994 (Federal Register, 1994, 59:58983). A category 2 referred to a "taxa for which information now in the possession of the [U.S. Fish and Wildlife Service] indicates that proposing to list as threatened or endangered is appropriate, but for which persuasive data on the biological vulnerability and threat are not currently available to support proposed rules." However, the Xantus's murrelet lost its candidate status when the category 2 designation was dropped in 1995.

The Xantus's murrelet is included in the North American Commission for Environmental Cooperation. One of the Commission's initiatives is to conserve biodiversity across shared ecosystems by identifying priority species for conservation, recovery objectives, and potential collaborative actions. However, recovery objectives and conservation actions for the Xantus's murrelet have yet to be defined (CDFG 2002).

Currently, the creation of Marine Protected Areas (MPAs) within the Channel Islands is being considered. The creation of MPAs would result in "no take" zones which would prohibit all or select fishery activities (CDFG 2002). The creation of MPAs around the Channel Islands would

potentially reduce threats to the Xantus's murrelet from human disturbance, artificial light pollution, and possibly fishery bycatch (CDFG 2002).

E. Other natural or manmade factors affecting its continued existence.

Artificial light pollution

Many nocturnal seabirds are attracted to bright lights on commercial fishing vessels (Cherel et al. 1996). Xantus's murrelets and other seabirds become exhausted by their continual attraction and fluttering near lights or collide with lighted vessels, the impact resulting in injury or death (Herbert 1970; Bower 2000). There have been several occurrences where lighted vessels along coastlines have reported numerous seabirds colliding with vessels (Dick and Donaldson 1978). Several seabird species have been captured as a result of light attraction and disorientation (Carter et al. 2000; Whitworth et al. 1997). Chicks have been known to become separated from their parents due to vessel lights, and this would have resulted in death of the chicks because they are dependent on their parents for survival (Gaston and Jones 1998). Gull activity and predation on seabirds is greater on moonlit nights and with lighted conditions than on dark nights (Nelson 1989; Keitt 1998).

On moonlit nights, many nocturnal seabirds display reduced activity levels such as fewer nest site visits and fewer chick departures to sea, which is thought to occur in order to avoid predation (Manuwal 1974; Watanuki 1986; Nelson 1989; Ainley et al. 1990; Jones et al. 1990; Keitt 1998). The CDFG (2002) report states that "it is reasonable to expect that successive nights of high artificial light levels on and around breeding colonies would disrupt the normal nesting activities of Xantus's murrelets, which could result in nest abandonment, increased mortality of eggs and/or chicks, and increased predation rates of adults that do not return during lighted conditions."

One concern involves high-wattage lights (about 30,000 watts per boat) used on commercial market squid (*Loligo opalescens*) fishing vessels at night to attract squid to the surface of the water. These boats have been reported operating in shallow waters near Xantus's murrelet nesting colonies in the California Channel Islands, with several vessels often fishing simultaneously in the same area (PSG 2002). Unusually high predation on Xantus's murrelets by Western Gulls and Barn Owls was reported at Santa Barbara Island in 1999, and was attributed to bright lights from the squid fishing that occurred directly offshore for much of the breeding season (Wolf et al. 2000). The California Fish and Game Commission requires light shields and a limit of 30,000 watts per boat, made effective on May 31, 2000. The resulting effects are still unknown (PSG 2002).

Lights at ChevronTexaco's proposed LNG facility near the Coronados Islands in Mexico has the potential to impact the Xantus's murrelet nesting colony (Lindquist 2004), although the degree of these impacts are largely unknown. However, unlike the squid fisheries which are sporadic and mobile, this is a permanent facility and any impacts would be ongoing and long-term. ChevronTexaco is conducting studies in order to assess and possibly reduce impacts, including a monitoring program to determine the baseline seabird populations of the Coronados Islands.

Prey decline

Xantus's murrelets feed on small schooling fishes such as Northern anchovies (*Engraulis mordax*), rockfish (*Sebastes* sp.), sand lance/sandeels (*Ammodytes* sp.), and larval Pacific sauries (*Cololabis saira*), and euphausiids (*Thysanoessa spinifera*) (Hunt et al. 1979, Hamilton et al. 2004). Because reproductive success of seabirds is dependent upon the availability and abundance of prey (Sydeman et al. 2001), declines in the Xantus's murrelet population could be a result of declines in prey resources. Zooplankton (i.e., euphausiids) in the Southern California Bight declined by 80 percent between the 1950s and early 1990s (Roesler and Chelton 1987). Xantus's murrelets on Santa Barbara Island responded to the unavailability of larval northern anchovies by either failing to breed or delaying breeding until anchovies were more available (Hunt and Butler 1980). Changes in oceanographic conditions such as large shifts in sea surface temperatures may affect Xantus's murrelet food supply (Roth and Sydeman 2000). More information on the subject of prey decline is needed.

ChevronTexaco's proposal to build a LNG facility off the Coronados Islands could impact prey resources of Xantus's murrelets due to the output of millions of gallons of chlorinated seawater from this facility. The ocean waters around the Coronados Islands are highly productive and may be important foraging areas for breeding, migrating, and wintering seabirds such as Xantus's murrelets.

Military activities

Weapons testing and training exercises occur routinely in the Sea Test Range off southern California, and operations on Naval Base San Clemente Island overlap with potential foraging habitat of Xantus's murrelets (Carter et al. 2000). These activities may disturb Xantus's murrelets at sea using these areas. The Department of the Navy's Integrated Natural Resources Management Plan for San Clemente Island takes into consideration possible effects to the Xantus's murrelet (CDFG 2002). A Mexican Navy outpost is located on South Coronados Island, and an active Navy garrison exists on Guadalupe Island (Keitt 2000). As with all human activity, the presence of military personnel and activities increase the threat of introducing non-native predators to Xantus's murrelet colonies (McChesney and Tershy 1998). However, we have no direct information on the impacts of these activities; more information is needed.

Fisheries bycatch

Threats to Xantus's murrelets include mortality via bycatch in fisheries (Drost and Lewis 1995; Carter et al. 2000). Xantus's murrelets have been reported as bycatch in various set and drift gill-nets in British Columbia (CDFG 2002; PSG 2002). No Xantus's murrelets have been documented as bycatch in California, although no observer program exists for these fisheries (CDFG 2002). Bycatch may have minor effects on Xantus's murrelet populations but combined with other factors, may add to their decline as a whole (CDFG 2002; PSG 2002). More information on this subject is needed.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

SUMMARY OF THREATS

Some identified threats include the possibility of oil spills, reductions in prey availability,

introduced non-native predators at several nesting colonies, chronic human disturbance, and artificial light pollution. The recent proposal to build a liquid natural gas (LNG) facility 600 meters (1,969 feet) off Islas Los Coronados in Baja California, Mexico, is another potential threat to the species. This island contains one of the largest nesting populations of Xantus's murrelets in the world. The construction and operation of the proposed LNG facility at Islas Los Coronados could increase human disturbance to Xantus's murrelets. Potential sources of disturbance include: (1) bright lights at night from the facility and visiting tanker vessels; (2) noise from the facility; (3) noise from helicopters visiting the facility; (4) ingress and egress of tanker vessels; and (5) other vessels transporting personnel and supplies.

For species that are being removed from candidate status:

___Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2*
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: High. Xantus's murrelets has an extremely limited breeding range, as the entire world population nests within about 500 miles of coastline in southern California and along the coast of Baja California (PSG 2002). Therefore, identified threats such as a large oil spill or severely reduced prey availability could put entire or significant portions of the population at risk of extinction. Impacts of the proposed LNG plant at the Coronados Islands could endanger one of the largest nesting colonies, also risking a significant proportion of the population.

Further, the cumulative effects of other known and ongoing threats, such as chronic low productivity resulting in long-term declines in the population at Santa Barbara Island, the persistence of introduced non-native predators at several nesting colonies, chronic human disturbance, and artificial light pollution make the species more susceptible to extinction at some point in the future.

Imminence: Imminent. The proposed LNG plant is considered an imminent threat to the species.

Rationale for Change in Listing Priority Number (insert if appropriate)

___ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No.

DESCRIPTION OF MONITORING

Most of the nesting colonies in the U.S. and Mexico have recently been monitored and assessed in recent years (since 2000) by private organizations such as Island Research and Ecology Group, Humboldt State University, Island Conservation and Ecology Group, California Institute of Environmental Studies, and Hamer Environmental, L.P. Yearly monitoring is being conducted at the Coronados Islands, and Anacapa Island by Island Conservation and Ecology Group, and at Santa Barbara Island by the National Park Service. We are periodically receiving unpublished reports on the results of these monitoring activities.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: none

Indicate which State(s) did not provide any information or comments: California

LITERATURE CITED

Ainley, D. G., P. H. Henderson, and C. S. Strong. 1990. Leach's Storm-Petrel and Ashy Storm-Petrel. Pages 128-162 *in* (D. G. Ainley, and R. J. Boekelheide, eds.), Seabirds of the Farallon Islands: Ecology, Dynamics, and Structure of an Upwelling-system Community. Stanford University Press, Stanford, California.

American Trader Trustee Council. 2001. Final restoration plan and environmental assessment for seabirds injured by the American Trader oil spill. Report of the American Trader Natural Resource Trustee Council, U.S. Fish and Wildlife Service, California Department of Fish and Game, and National Oceanic and Atmospheric Administration.

Anderson, D. W., J. O. Keith, G. R. Trapp, F. Gress and L. A. Moreno. 1989. Introduced small ground predators in California Brown Pelican colonies. Colonial Waterbirds 12: 98-103

Bertram, D. F. 1995. The roles of introduced rats and commercial fishing in the decline of ancient murrelets on Langara Island, British Columbia. Conservation Biology 9(4): 865-872.

Bower, J. 2000. The dark side of light. Audubon, 102(2):92-97.

Briggs, K. T., W. B. Tyler, D. B. Lewis, and D. R. Carlson. 1987. Bird communities at sea off California: 1975 to 1983. Studies in Avian Biology 11:1-74.

California Department of Fish and Game (CDFG). 2002. Petition Evaluation for Xantus's Murrelet (*Synthliboramphus hypoleucus*). Unpublished report prepared by the California Department of Fish and Game. 58p.

Carter, H. R., G. J. McChesney, D. L. Jaques, C.S. Strong, M. W. Parker, J. E. Takekawa, D. L. Jory, and D. L. Whitworth. 1992. Breeding populations of seabirds in California, 1989-1991. Unpublished report, U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Dixon, California.

Carter, H. R., D. L. Whitworth, W. R. McIver, J. B. Bulger, and G. J. McChesney. 1996. Survey of Xantus' Murrelet (*Synthliboramphus hypoleucus*) and other marine birds at Islas Los Coronados, Baja California Norte, Mexico, on 23-25 April 1995. Unpublished Report, U.S. Geological Survey, Biological Resources Division, Dixon, California

Carter, H. R. and K. J. Kuletz. 1995. Mortality of Marbled Murrelets due to oil pollution in North America. Pages 161-169 in Ralph, C. J., G. L. Hunt, Jr., M. G. Raphael, and J. F. Piatt (eds.), Ecology and Conservation of the Marbled Murrelet. U. S. Forest Service, Gen. Tech. Rep. PSW-GTR-152, Pacific Southwest Research Station, Albany, CA.

Carter, H. R., Whitworth, D. L., Takekawa, J. Y., Keeney, T. W. and Kelly, P. R. 2000. At-sea threats to Xantus' Murrelets (Synthliboramphus hypoleucus) in the Southern California Bight. Pages 435-447 in D. R. Browne, H. W. Chaney, and K. L. Mitchell, editors. Fifth Channel Islands Symposium. Minerals Management Service, Camarillo, California.

Channel Islands National Park (CINP). 2002 December 3. Channel Islands home page. <http://www.nps.gov/chis/homepage.htm> Accessed February 4, 2003.

Cherel, Y., H. Weimerskirch, and G. Guhamel. 1996. Interactions between longline vessels and seabirds in Kerguelen waters and a method to reduce seabird mortality. Biological Conservation, 75:63-70.

DeLong, R. L. 1968. Preliminary report, Eastern Area Cruise 42, 20-23 June 1968, Guadalupe

Island. Unpublished report, Pacific Ocean Biological Survey Program, Smithsonian Institution, Washington, D. C.

DeWeese, L. R. and D. W. Anderson. 1976. Distribution and breeding biology of Craveri's Murrelet. Transactions of the San Diego Natural History Society 18:155-168.

Dick, M. H. and W. Donaldson. 1978. Fishing vessel endangered by crested auklet landings. Condor, 80:235-236.

Drost, C. A. and D. B. Lewis. 1995. Xantus' Murrelet (*Synthliboramphus hypoleucus*). *In* The Birds of North America, No. 164 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Everett, W. T. and D. W. Anderson. 1991. Status and conservation of the breeding seabirds on offshore Pacific islands of Baja California and the Gulf of Mexico. Pages 115-139 *in* J. Croxall (ed.), Seabird status and conservation; a supplement. ICBP Technical Publication 11.

Gaston, A. J. 1992. The Ancient Murrelet: a natural history in the Queen Charlotte Islands. T&AD Poyser, London, United Kingdom.

Gaston, A. J., I. L. Jones. 1998. The Auks, Alcidae. Oxford University Press Inc., New York, New York. 349 pp.

Griggs, Jack L. 1997. All the Birds of North America. New York: Harper Collins Publishers, Inc. 172 p.

Grinnell, J. and A. Miller. 1944. The Distribution of the Birds of California. Pacific Coast Avifauna Number 27, Cooper Ornithological Club, Berkeley, California.

Hamilton, C.D. 2005. At-sea distribution, habitat, and foraging behavior of Xantus's Murrelets in the Southern California Bight. Master's thesis. Humboldt State University.

Hamilton, C. D., H. R. Carter, and R. T. Golightly. 2004. Diet of Xantus's Murrelets in the Southern California Bight. Wilson Bulletin 116:152-157.

Herbert, A. D. 1970. Spatial disorientation in birds. Wilson Bulletin 82(4):400-419.

Howell, A. B. 1910. Notes from the Los Coronados Islands. Condor 12:184-187.

Howell, A. B. 1917. Birds of the islands off the coast of southern California. Pacific Coast Avifauna Number 12, Cooper Ornithological Club, Hollywood, California.

Hunt, G. L., Jr., and J. L. Butler. 1980. Reproductive ecology of Western Gulls and Xantus's Murrelets with respect to food resources in the Southern California Bight. California

Cooperative Oceanic Fisheries Investigation Report 21:62-67.

Hunt, G. L., Jr., R. K. Pitman, M. Naughton, K. A. Winnett, A. Newman, P. R. Kelly, and K. T. Briggs. 1979. Distribution, status, reproductive ecology and foraging habits of breeding seabirds. Pages 1-399 in Summary of marine mammal and seabird surveys of the Southern California Bight area, 1975-1978. United States Department of Interior, Bureau of Land Management, Los Angeles, California. PB-81-248-205.

Ingram, T., and D. Jory Carter. 1997. Seabird monitoring, Channel Islands National Park, 1991-1992. Channel Islands National Park Technical Report 97-02 *in* Pacific Seabird Group. 2002. Petition to the California Fish and Wildlife Service to List the Xantus's Murrelet as Threatened Under the United States Endangered Species Act. Ventura Fish and Wildlife Office.

Jehl, J. R. and S. I. Bond. 1975. Morphological Variation and Species Limits in Murrelets of the Genus *Endomychura*. Transactions of the San Diego Society of Natural History. Vol. 18, No. 2.

Jones, I. L., A. J. Gaston, and J. B. Falls. 1990. Factors affecting colony attendance by ancient murrelets (*Synthliboramphus antiquus*). Canadian Journal of Zoology, 68:433-441.

Keitt, B. S. 1998. Ecology and Conservation Biology of the Black-vented Shearwater (*Puffinus opisthomelas*) on Natividad Island, Vizcaino Biosphere Reserve, Baja California Sur, Mexico. Unpublished M. S. thesis, University of California, Santa Cruz, California.

Keitt, B. S. 2000. Status of the Xantus' Murrelet (*Synthliboramphus hypoleucus*) on the islands of Baja California, Mexico. Unpublished report, Island Conservation and Ecology Group, Davenport, California. Available at: http://www.islandconservation.org

Lindquist, Diane. 2004. Fears of a paradise lost: Many worry gas plan will keep them away from the Coronados Islands. Sign on San Diego. Posted May 20, 2004. Available at: http://www.signonsandiego.com

Manuwal, D. A. 1974. The natural history of Cassin's auklet. Condor, 76:421-431.

McChesney, G. J. and B. R. Tershy. 1998. History and status of introduced mammals and impacts to breeding seabirds on the California Channel and Northwestern Baja California islands. Colonial Waterbirds 21: 335-347.

McChesney, G. J., F. Gress, H. R. Carter, and D. L. Whitworth. 2000. Nesting habitat assessment for Xantus' Murrelets and other crevice-nesting seabirds on Anacapa Island, California, in 1997. Unpublished report, U.S. Geological Survey, Western Ecological Research Center, Dixon, California; and Department of Wildlife, Humboldt State University, Arcata, California. 34pp.

Moors, P. J. and I. A. E. Atkinson. 1984. Predation on seabirds by introduced animals, and factors affecting its severity. Pp. 667-690 *in* J. P. Croxall, P. G. H. Evans, and R. W. Schreiber (eds.), Status and conservation of the world's seabirds. ICBP Technical Publication No. 2.

Murray, K. G., K. Winnett-Murray, Z. A. Eppley, G. L. Hunt, Jr., and D. B. Schwartz. 1983. Breeding biology of the Xantus' Murrelet. Condor 85: 12-21.

Mustelli, Robin. 2000. Santa Cruz Sentinel. UCSC research helped lawsuit against DDT maker. Accessed on January 17, 2003. Available at http:\\www.santacruzsentinel.com/archive/2000/December/21/top/stories/2top.htm.

Nelson, D. A. 1989. Gull predation on Cassin's Auklet varies with the lunar cycle. Auk 106: 495-497.

Oil Spill Intelligence Report, 1997. Cutter Information Corp., 37 Broadway, Suite 1, Arlington, MA 02174 *in* Pacific Seabird Group. 2002. Petition to the California Fish and Wildlife Service to List the Xantus's Murrelet as Threatened Under the United States Endangered Species Act. Ventura Fish and Wildlife Office.

Pacific Seabird Group (PSG). 2002. Petition to the California Fish and Wildlife Service to List the Xantus's Murrelet as Threatened Under the United States Endangered Species Act. Ventura Fish and Wildlife Office.

Roesler, C. S. and D. B. Chelton. 1987. Zooplankton variability in the California Current, 1951-1982. California Cooperative Oceanic Fisheries Report 28:59-96.

Roth, Jennifer E. and William J. Sydeman. 2000. Xantus' Murrelet, Synthliboramphus hypoleucus I: Status and Conservation. Endangered Species Update. Vol. 17, No. 4. Pp 82-84.

Seto N. W. H. and S. Conant. 1996. The effects of rat (*Rattus rattus*) predation on the reproductive success of the Bonin Petrel (*Pterodroma hypoleuca*) on Midway Atoll. Colonial Waterbirds, 19(2): 171-185.

Sowls, A. L., A. R. DeGange, R. Anthony, J. W. Nelson, and G. S. Lester. 1980. Catalog of California seabird colonies. FWS/OBS-37/80. Washington, DC: U.S. Fish and Wildlife Service, Biological Services Program; 371 pp.

Sumner, Lowell. 1958. The Rabbits of Santa Barbara Island: A Progress Report and Summary. Transcribed by Rachael Willie, August 15, 2002.

Sydeman, W. J., N. Nur, and P. Martin. 1998. Population viability analyses for endemic seabirds of the California marine ecosystem: the Ashy Storm-Petrel (*Oceanodroma homochroa*) and Xantus' Murrelet (*Synthliboramphus hypoleucus*). Unpublished report,

Point Reyes Bird Observatory, Stinson Beach, California.

Sydeman, William J. and Nur, Nadav. 2000. Xantus' Murrelet, Synthliboramphus hypoleucus II: Assessment of Listing Status. Endangered Species Update. Vol. 17, No. 4. Pp 85-87.

Sydeman, W. J., M. M. Hester, J. A. Thayer, F. Gress, P. Martin, and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49: 309-329.

Watanuki, Y. 1986. Moonlight avoidance behavior in Leach's storm-petrels as a defense against slaty-backed gulls. Auk 103:14-22.

Weiss, Kenneth R. LA Times. Scientists Shed Light on Sea Caves' Wildlife. November 9, 2002. November 20,2002. LA Times articles on seacaves and seabirds. Personal email. Accessed online November 20, 2002.

Whitworth, D. L., J. Y. Takekawa, H. R. Carter, and W. R. McIver. 1997. A night-lighting technique for at-sea capture of Xantus's Murrelets. Colonial Waterbirds, 20(3):525-531.

Whitworth, D. L., J. Y. Takekawa, H. R. Carter, S. H. Newman, T. W. Keeney, and P. R. Kelly. 2000. Distribution of Xantus' Murrelet *Synthliboramphus hypoleucus* at sea in the Southern California Bight, 1995-97. Ibis 142: 268-279.

Whitworth, D. L., B. S. Keitt, H. R. Carter, G. J. McChesney, J. W. Mason, W. R. McIver, and A. J. Hebshi. Preliminary assessment of the status of Xantus's Murrelets (*Synthliboramphus hypoleucus)* at the San Benito Islands, Baja California, Mexico, in March 2002. Unpublished report, Humboldt State University, Department of Wildlife, Arcata, California; and Island Conservation and Ecology Group, University of California, Santa Cruz, California.

Whitworth, D. L., J. S. Koepke, F. Gress, and S. Fangman. 2004. Nest monitoring of Xantus's Murrelets (*Synthliboramphus hypoleucus)*at Anacapa Island, California: 2004 annual report. Unpublished report, California Institute of Environmental Studies, Davis, California.

Whitworth, D. L. and H. R. Carter. 2002. Alolkoy. Xantus's Murrelets and Predation in the Channel Islands. Vol 15 No. 1. p 5.

Winnett, K. A., K. G. Murray, and J. C. Wingfield. 1979. Southern race of the Xantus' Murrelet breeding on Santa Barbara Island, California. Western Birds 10: 81-82.

Wolf, S. 2002. The relative status and conservation of island breeding seabirds in California and Northwest Mexico. Master's thesis. University of California, Santa Cruz.

Wolf, S., J. E. Roth, W. J. Sydeman, and P. L. Martin. 2000. Population size, phenology and productivity of seabirds on Santa Barbara Island, 1999. Channel Islands National Park Technical Report (CHIS 00-02), Point Reyes Bird Observatory, Stinson Beach, California.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Paul Henson April 26, 2006
Acting CNO Manager, Fish and Wildlife Service Date

Concur: _____ August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do not concur: _____
Director, Fish and Wildlife Service Date

Date of annual review:
Conducted by: